marquardt AIRCRAFT CO.

Report No. PR 211-2

Enclosure (1)

(Unclassified Title)

LOW PRESSURE COMBUSTION INVESTIGATION

Contract No. NOas 59-0117

Marquardt Project No. 211

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I. INTRODUCTION

This is the second monthly letter progress report on Navy Contract NOas 59-0117 (MAC Project 211) for the period 2 January 1959 to 2 February 1959.

The objectives of this program are:

a. to evaluate combustion performance of a 28-inch diameter ramjet engine operating at combustion pressures less than 6 psia for pentaborane, HiCal-3, SF-1, and hydrocarbon fuels

b. to evaluate the structural reliability of a full-scale nonmetallic tailpipe and exhaust nozzle

c. to determine the infrared radiation of the exhaust plume of a 28-inch ramjet engine operating at combustion pressures less than 6 psia with pentaborane, HiCal-3, SF-1, and hydrocarbon fuels.

II. PROGRAM PROGRESS

Since the last progress report, Cmdr. Struble has requested that hydrocarbon fuel be included as one of the fuels to be evaluated. Thus, the program objectives have been modified to include a hydrocarbon as the fourth fuel. This increased scope has necessitated an increase in MJL Cell 8 occupancy to an equivalent of three weeks. As a result of this, a request for additional funds was necessary to cover the cost of increased cell occupancy. As directed by Cmdr. Struble, an amendment to MAC Proposal 1614 has been submitted to cover this. Due to the extra test time, the cell occupancy has been rescheduled to start on 24 February 1959.

Planning and hardware evaluation and modification are progressing satisfactorily. The test plan has been completed and cell fuel system modifications are awaiting approval by the Los Angeles City Fire Department. Both the HiCal-3 and pentaborane fuels have been received, and the other fuels can be readily supplied locally. Thus, the fuel supply situation is under control.

Due to the several objectives of the program and the limited supply of special fuels, careful planning will be necessary in running the infrared measurement tests. It may be that traversing of the jet will be restricted to two or three points in the jet or that complete traversing will be restricted to SF-1 and the hydrocarbon fuels. Of course, all fuels will be evaluated at the center of the jet plume.

With the setback of the test date, it is anticipated that Goodyear Aircraft Corp. will have no trouble supplying the nonmetallic tailpipe and exhaust nozzle. Goodyear has already fabricated and shipped a 12-inch diameter cylinder for preliminary evaluation at Marquardt. Preliminary tests at Goodyear Aircraft show that the nonmetallic material can stand 800°F temperatures for at least four hours. However, negotiations are still in progress to obtain an alternate supplier. Unfortunately, the local source with a promising material could not fabricate a structure the size of our tailpipes. Currently, negotiations are in progress with the B. F. Goodrich Company, who have run furnace tests of samples at 700°F for three hours.

III. PROBLEMS ENCOUNTERED

A. Authorization from the Air Force to run the tests in Cell 8 of MJL has not been received. However, Mr. N. Rekos of BuAer, Washington, D. C. has indicated that a letter was sent to the Air Force on 28 January 1959.

B. Contract coverage for the cost of operating Cell 8 of MJL has not been received.

C. It may not be possible to get complete documentation of infrared radiation from HiCal-3 and pentaborane, due to limited supply of these fuels.

D. Due to checkout problems of a new high temperature heater for MJL Cell 8, the maximum air temperature may be restricted to 400°F instead of the 700°F planned. However, this will only influence the combustion performance part of the tests. If tests are run with the lower temperature and the combustion efficiencies are high, then there are no problems because the higher air temperature will aid the combustion process.

IV. ESTIMATED COST TO DATE

The estimated cost, including all commitments, through 25 January 1959 is:

$26,190.23